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Fabrication and Repair of Graphite/Epoxy Laminates

New fabrication and repair methods have been developed for graphite/epoxy laminates. The laminates are of high quality and range in thickness from 0.012 to 0.018 in. (0.31 to 0.46 mm).

In the fabrication process, five separate laminate layers are used. The layers are mounted one on top of another in crisscrossing patterns with the fibers running alternately at +45°, -45°, 0°, -45°, +45°. Each layer is 0.0015 in. (0.038 mm) thick. The layup tool used in this process is made from aluminum because of its high coefficient of thermal expansion. This characteristic is utilized to stretch the laminate when the assembly is heated. The result is improved fiber alignment.

During the fabrication process, the mounted laminate structure is covered with a vacuum bag and is cured in an autoclave at a temperature of 180° F (83° C) at atmospheric pressure. After 10 minutes, the laminate is removed and smoothed with Teflon paddles. The process is repeated three times for a total of 30 minutes. After smoothing, the part is subjected to the standard cure cycle under an autoclave pressure of 100 psi (6.9×10^5 N/m²) and a temperature of 360° F (184° C).

These laminate structures can be repaired using a four-layer, precured graphite/epoxy patch with the layer fibers crisscrossed at +45°, -45°, -45°, and +45°.

The damaged area is cleaned to remove all the loose graphite/epoxy fragments by buffing the surface. The bottom side of the patch is roughened and cleaned to provide a good bond surface. Next, room-temperature-curing epoxy adhesive is spread over the damaged region, and the patch is put in place. The repair is cured under 10 psi (6.9×10^4 N/m²) for approximately 16 hours.

Note:

Requests for further information may be directed to:

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Patent status:

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